Toxicity of Bacillus thuringiensis biopesticide produced in shrimp pond sludge as alternative culture medium against Bactrocera dorsalis (Hendel)

ABSTRACT

Among entomopathogenic bacteria, Bacillus thuringiensis (Bt) has been widely used to replace the conventional chemical pesticides to control insect pets. However, their application is limited due to high production cost through fermentation. In this study, shrimp pond sludge was used as an alternate culture medium for Bt ATCC10792. The sludge was used under three different preparations; (i) without pre-treatment, (ii) with acid treatment (hydrolysed sludge) and (iii) the supernatant obtained after the centrifugation of the hydrolysed sludge. Bacterial growth rate and sporulation were evaluated throughout the fermentation. The highest growth rate and sporulation were observed in hydrolysed sludge with 7.44x106±5.16 CFU/ml and 5.90x106±7.88 CFU/ml, respectively. Bioassay of entomotoxicity test was also carried out on the fruit fly larva, Bactrocera dorsalis (Hendel) and 81.2% mortality was observed. A significant deterioration was observed in larval weight and size. Larval pupation was also reduced in size where treated pupa was 30% smaller than the control and therefore lowering the adult fly emergence rate. Emerged adult fruit fly showed physical deterioration on the morphology (undeveloped, crumpled wings and cranked abdomen) and significantly affecting the survival rate of the flies. This study has proven the potential of shrimp pond sludge to be used as an alternate culture medium for Bt-based biopesticides production.

Keyword: Oriental fruit fly; Bacteria; Fermentation; Entomotoxicity